

Linkages between physical activity and nightly salivary cortisol in a pilot study of adolescents



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Introduction

- Physical activity can be beneficial for reducing psychosocial stress. Significant associations have been found between high intensity exercise and elevated salivary cortisol levels— a physiologic stress marker^{1,2}
- Most research is focused on well-trained, high endurance, or elite athletes
- Research addressing the general adolescent population's physiology and hormonal response is lacking

Purpose

- The purpose of the study was to explore associations between the frequency of moderate/ strenuous physical activity among adolescents and their averaged nightly cortisol level collected over a one week time period



Methods

- Secondary data were analyzed
- The sample of 22 adolescents aged 11-17 were recruited from one high-income census tract (n=12) and one low-income census tract (n=10) in an urban area in the Midwest
- Data were collected over a 1 week time frame in which youth completed a survey and self-collected nightly saliva samples for cortisol on nights 1-6

Measures

- Two survey questions were asked related to participation in strenuous and moderate physical activity over the prior week (range 0-10)
- The frequencies were summed to create a total score of moderate/ strenuous physical activity over the prior week
- Scores were dichotomized to compare adolescents who engaged in moderate/ strenuous physical activity 6-10 per week to those who engaged 0-5 times per week
- Nightly cortisol levels were assessed via ELISA and the week's values were averaged and logged due to the skewed distribution

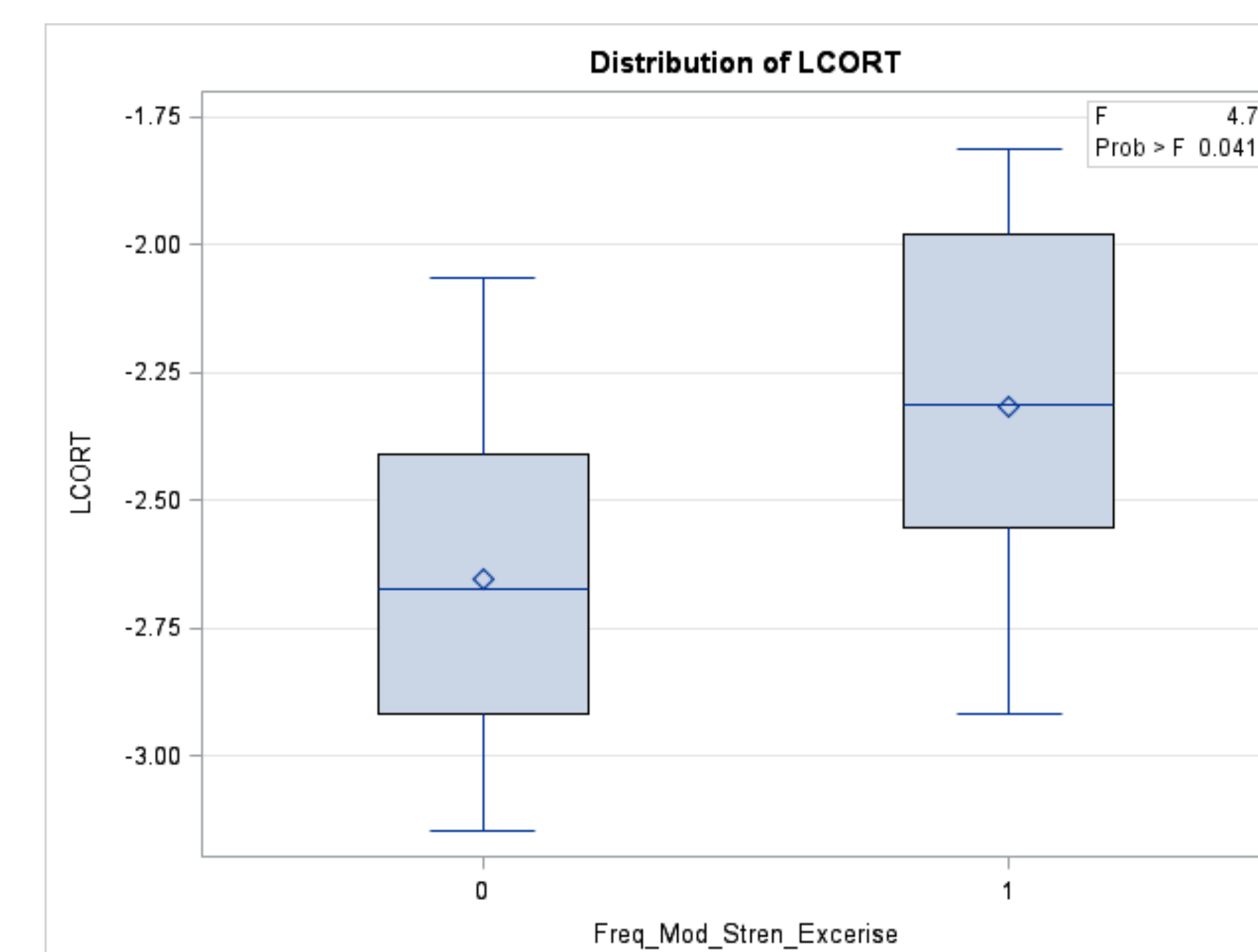
Results

Sample Characteristics

- 11 males and 11 females
- Average age 13.6 years
- Moderate/ strenuous physical activity 6-10 times per week = 40.9% (n=9)

Bivariate Associations

- Spearman rho correlation between the total score of moderate/strenuous physical activity and the averaged nightly cortisol was modest (0.37, $p < 0.09$)
- ANOVA bivariate analysis indicated adolescents who engaged in moderate/ strenuous physical activity 6-10 per week had higher mean cortisol values compared to their less active peers ($p < 0.05$)



Discussion

- This study suggests that more frequent participation in moderate/ strenuous physical activity elicits, on average, a higher level of cortisol at bedtime
- Although previous research has shown that physical activity has positive health benefits, too much strenuous physical activity may have a negative impact on adolescent health, growth, and development
- Further research is needed to explore the impact of physical activity on cortisol levels over the transition from adolescence to young adulthood

Limitations

- Small sample size
- Lack of measurement on daily physical activity to compare to nightly cortisol sample, including time between last exercise and cortisol collection
- Salivary diurnal cortisol curve not collected

References

- McGuigan, M. (2004). Salivary cortisol responses and perceived exertion during high intensity and low intensity bouts of resistance exercise. *Journal of Sports Science & Medicine*, 3(1), 8-15.
- VanBruggen, M. D., Hackney, Anthony C., McMurray, R. G., & Ondrak, K. S. (2011). The relationship between serum and salivary cortisol levels in response to different intensities of exercise. *International Journal of Sports Physiology & Performance*, 6(3), 396-407.